

6.00 credits

Q2

Language :	English
Place of the course	Autre site
Prerequisites	The following BNEN courses are a prerequisite <ul style="list-style-type: none"> <li>- Nuclear Energy: Introduction</li> <li>- Introduction to Nuclear Physics and Measurements</li> </ul> Mathematics (differential equations, taylor expansions, fourier expansions, bessel functions)
Learning outcomes	<p><b>At the end of this learning unit, the student is able to :</b></p> <ul style="list-style-type: none"> <li>• To understand the physical processes involved in a nuclear reactor</li> <li>• To understand and be able to write down and solve the basic equations</li> <li>• To be able to simulate a reactor/source configuration (geometry, composition) as appropriate depending on:                             <ul style="list-style-type: none"> <li>- number of dimensions;</li> <li>1 - steady state or transient;</li> <li>- number of groups;</li> <li>- delayed neutron precursors;</li> <li>- space dependent properties.</li> </ul> </li> <li>• To learn how to measure neutron distributions and parameters relevant for nuclear reactors, in particular reactivity and reactivity coefficients</li> </ul>
Evaluation methods	Written examination, open book.
Content	<ul style="list-style-type: none"> <li>• Physics of nuclear reactors</li> <li>• Transport and diffusion</li> <li>• Spatial dependence</li> <li>• Slowing down theory</li> <li>• Resonance integrals</li> <li>• Cell calculations</li> <li>• Neutron thermalisation</li> <li>• Multigroup equations</li> <li>• Criticality dependence on geometry and composition</li> <li>• Reactivity and control</li> <li>• Reactor dynamics</li> <li>• Reactor codes</li> <li>• Neutron sources and detectors</li> <li>• Basic measurements: source strength, neutron flux (activation analysis, neutron counting), neutron spectrum reaction rates</li> <li>• Activity, dose and cross-section measurement</li> <li>• Measurement of neutron transport parameters: stationary methods, pulsed neutron experiments</li> <li>• Measurement of reactivity (and reactivity coefficients): survey, static methods, dynamic measurements, inverse kinetics, neutron noise fluctuation methods</li> </ul>
Other infos	This course is part of the Advanced Master programme in nuclear engineering organized by the Belgian Nuclear Higher Education Network (BNEN). BNEN is organised through a consortium of six Belgian universities and the Belgian Nuclear Research Centre, SCK-CEN and takes place at the SCK-CEN in Mol. Information : <a href="https://www.sckcen.be/fbnen">https://www.sckcen.be/fbnen</a>
Faculty or entity in charge	EPL

<b>Programmes containing this learning unit (UE)</b>				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Advanced Master in Nuclear Engineering	GNUC2MC	6		